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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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SEYFARTH SHAW LLP 131 S. DEARBORN ST., SUITE2400 CHICAGO, IL 60603-5803			EXAMINER RAO, G NAGESH	
			ART UNIT 1722	PAPER NUMBER
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	Application No. 10/522,956	Applicant(s) EGEBERG, PER KRISTIAN	
	Examiner G. Nagesh Rao	Art Unit 1722	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☒ Claim(s) 5,6 and 12-16 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |  |
|--|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                 | 5) <input type="checkbox"/> Notice of Informal Patent Application                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date ____ | 6) <input type="checkbox"/> Other: ____  |

***Information Disclosure Statement***

1) The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609.04(a) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

***Claim Objections***

2) Claims 5-6 and 12-16 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. The aforementioned claims refer to an apparatus limitation on the process for producing Solar Grade Silicon, whereby the dependent claims refer to the structure and components that make up the apparatus rather than further limit in a step-limiting manner the claims set forth by the method of producing said Solar Grade Silicon. Applicant is advised to correct such deficiency in order to bring claims in commensurate scope of the claimed invention.

***Drawings***

3) The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: Element 5 in Figure 3A as mentioned in the specification is not in the drawings listed. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: Reference numeral 6 of Figure 3A. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are

required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

- 4) Claims 1-2 and 7-16 are rejected under 35 U.S.C. 102(b) as anticipated by Carman (US Patent No. 4,272,488).

Carman 488 pertains to the method of manufacturing Silicon by thermal decomposition that is capable of being produced at the Solar Grade level.

Furthermore Carman depicts and explains via Figure 1 a silicon precursor in the presence of an excess of hydrogen by separately introducing hydrogen gas and the silicon precursor in a vertically oriented reaction chamber in which the lower portion holds a pool of molten silicon, the surface of which the reactants are directed toward and react during the formation of essentially elementary silicon and hydrogen chloride, off gases and by-products formed are withdrawn from the upper portion of the column; silicon formed is withdrawn from the lower portion of the reactor, characterized in that the fluid silicon precursor is introduced at ambient temperatures through a pipe arranged coaxially in a feed pipe for hydrogen gas, where the hydrogen gas functions as a cooling medium for the introduced silicon precursor, in that a steep temperature gradient is held within the reactor, and that the reactants are conducted at great speed toward the surface of the molten silicon by rapid expansion of the silicon precursor and hydrogen gas, and brought to react in the lower warm portion of the reactor, in that any formed silicon chloride reacts with the excess hydrogen in the upper portion of the reactor and falls as particulate solid silicon.

Furthermore Carman 488 teaches the silicon precursor may be of halogenated silane form and the lower portion of the reactor is held at a temperature above 1685 K which anticipates the 1410<sup>0</sup> C claimed range as well is taught a secondary chamber or i.e. reads on as a “particle recapture tower”, whereby reacting low grade silicon with hydrogen chloride gas during the formation of trichlorosilane which is introduced into a reactor wherein said reactor comprises an elongated container with an inert lining, where the container is equipped with an injection system for a silicon precursor, preferably trichlorosilane, and hydrogen, and an outlet for unconverted hydrogen HCl and any by-products, characterized by a constant level outlet system for produced, liquid silicon, that the, feed system comprises an outer pipe for introducing hydrogen gas and a pipe arranged coaxially with pipe for the introduction of fluid silicon precursor, and where the height of the reactor is sufficient to establish the necessary steep temperature gradient according to which unconverted hydrogen and hydrogen chloride are separated and hydrogen chloride gas is used for the conversion of additional low grade silicon and the hydrogen gas is introduced as a reactant in the process.

Furthermore Carmen 488 teaches as can be seen in Figure 1 an inert lining, where the container is equipped with an injection system for a silicon precursor,

an outlet for unconverted hydrogen HCl and any by-products, a feed system comprises an outer pipe for introducing hydrogen gas and a pipe arranged coaxially with hydrogen gas introduction pipe for the introduction of fluid silicon precursor, and where the height of the reactor is sufficient to establish the necessary steep temperature gradient.

Finally Carmen 488 for the production of Solar Grade Silicon by thermal decomposition of a silicon precursor in the presence of an excess of hydrogen by separately introducing hydrogen gas and the silicon precursor in a vertically oriented reaction chamber in which the lower portion holds a pool of molten silicon, the surface of which the reactants are directed toward and react during the formation of essentially elementary silicon and hydrogen chloride, off gases and by-products formed are withdrawn from the upper portion of the column; silicon formed is withdrawn from the lower portion of the reactor, characterized in that the fluid silicon precursor is introduced at ambient temperatures through a pipe arranged coaxially in a feed pipe for hydrogen gas, where the hydrogen gas functions as a cooling medium for the introduced silicon precursor, in that a steep temperature gradient is held within the reactor, and that the reactants are conducted at great speed toward the surface of the molten silicon by rapid expansion of the silicon precursor and hydrogen gas, and brought to react in the lower warm portion



of the reactor, in that any formed silicon chloride reacts with the excess hydrogen in the upper portion of the reactor and falls as particulate solid silicon on the off gases from the primary decomposition chamber (See Figure 1 Cols 1-4 Lines 1-65).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
  2. Ascertaining the differences between the prior art and the claims at issue.
  3. Resolving the level of ordinary skill in the pertinent art.
  4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
- 5) Claims 3-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carman (US Patent No. 4,272,488) in view of Levin (US Patent No. 4,668,493).

From the aforementioned rejection Carman 488 taught the method for producing and recapture tower of obtaining silicon material capable of being fabricated at a solar grade level.

However Carman 488 is silent with respect to the method limitation of the cold upper portion for the silicon material being at under  $400^{\circ}\text{C}$  nor the level of molten silicon in the reactor is held constant by a constant level system for continuous removal.

In analogous art pertaining to the fabrication of silicon as well with hydrogen precursor ingredients, Levin 493 stresses on its system the use of a constant level system for continuous removal of the by products as well processing the silicon at a temperature below  $400^{\circ}\text{C}$  in order to further create better processing conditions for the continuous production of molten solar grad material (See Abstract, Figs 1-4, Cols 7-14 Lines 1-68).

Therefore it would have been obvious to one having ordinary skill in the art at the time of the present invention to employ the teachings of Levin 493 with that of Carmen 488 in order to further ensure a more efficient and optimized condition of processing for the silicon material so that it is fabricated at the solar grade level.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to G. Nagesh Rao whose telephone number is (571) 272-2946. The examiner can normally be reached on 9AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Yogendra Gupta can be reached on (571)272-1316. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

  
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